LA-UR-21-25805
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Title: Vessel Fabrication Overview

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Intended for: Presentation for Vessel Fabrication

Issued: 2021-06-21

Los Alamos NATIONAL LABORATORY

Vessel Fabrication Overview

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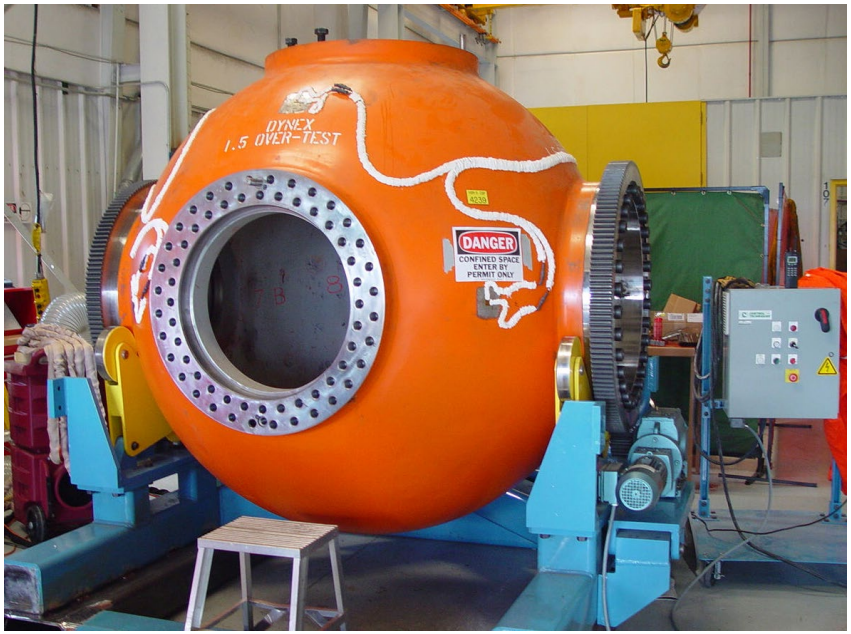
June 2021

Mission Need

- LANL utilizes spherical vessels for numerous basic science, materials, and system performance experiments
- These pressure vessels are designed and fabricated to meet the *intent* of ASME B&PV Section VIII, Division 3 and Code Case 2564
  - LANL has successfully contracted vessel construction in the past, utilizing HSLA-100 steel
- As current vessel inventories approach design life, we are once again embarking upon a series of fabrication contracts to produce replacement components and vessel assemblies to support continued experiment cadence at LANL
- LANL's intent is to ramp up a continuous vessel supply chain for the DOE Complex

LANL Vessels

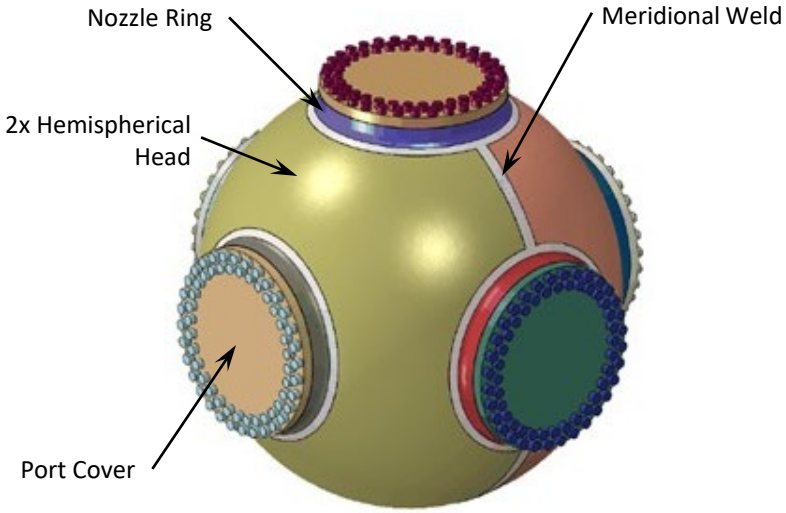
Ø6’ Spherical – 5 port



Ø3’ Spherical – 5 port

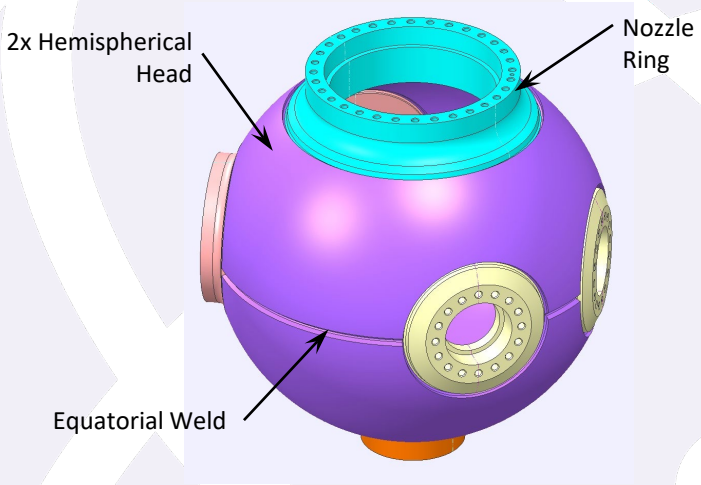
LANL Current Vessel Designs

Ø6’ 5-Port Vessel



Production: 2-1/2” Thick Wall, ≈14,000 lbs
First Article: 2” Thick Wall, ≈ 11,000 lbs

Ø3’ 5-Port Vessel



Production: 1-1/8” Thick Wall, ≈ 1,800 lbs
First Article: 1” Thick Wall, ≈ 1,600 lbs

Vessel Components (GFE)

Material: HSLA-100

- High Strength
- High Low Temperature Toughness
- Repairable: No Post-Weld Heat Treatment

Nozzle Ring Forgings
(Four Sizes Utilized)

Hemispherical Heads
(6’ and 3’)

Cover Disk Forgings
(Two Sizes Utilized)

Additional Fabrication Materials

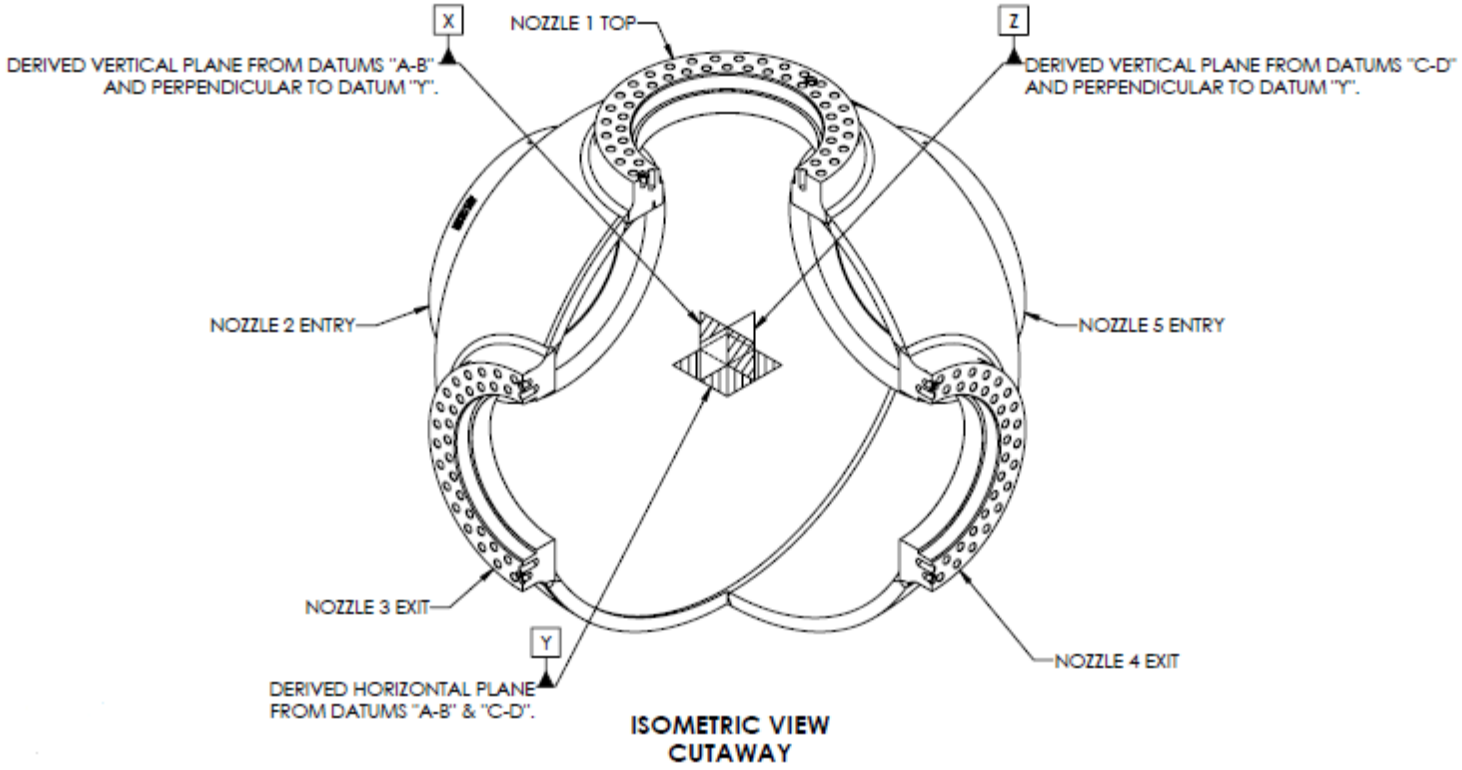
LANL (GFE)

- Plate Provided for Welding Procedure & Performance Qualification

Subcontractor

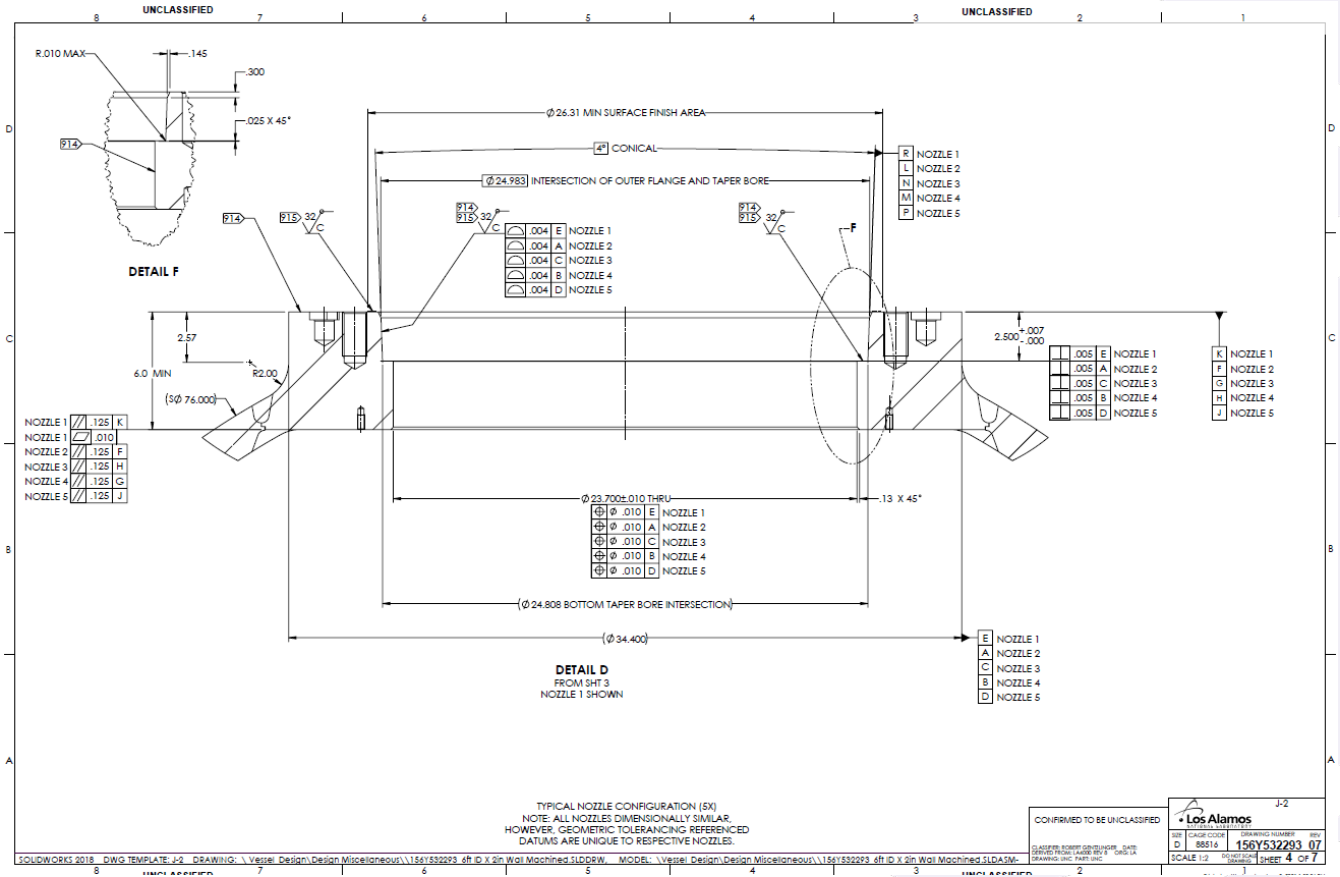
- Weld Filler Metal & Other Consumables
- Fixturing
- Machining Consumables
- NDE Consumables
- Nuts, Bolts, O-rings & Misc. Hardware

Sample Vessel Construction Drawing



6ft

Sample Vessel Construction Drawing



6ft

Contract Overview and Structure

Construction Contracts for 3’ and 6’ Vessels

- First Article (Current)
  - 6’ Vessel First Article
    - Successful completion and acceptance qualifies subcontractor for production
  - 3’ Vessel First Article
    - Successful completion and acceptance qualifies subcontractor for production
- Production
  - 6’ Vessels (initial qty up to 20)
  - 3’ Vessels (initial qty up to 9)
  - Forecasting On-going 2-3 Vessels/Year Beyond Initial Vessel Needs

Note: Each subcontractor must successfully meet all First Article technical performance criteria to be eligible/qualified for production contract awards. Successful First Article does not guarantee award of production contract.

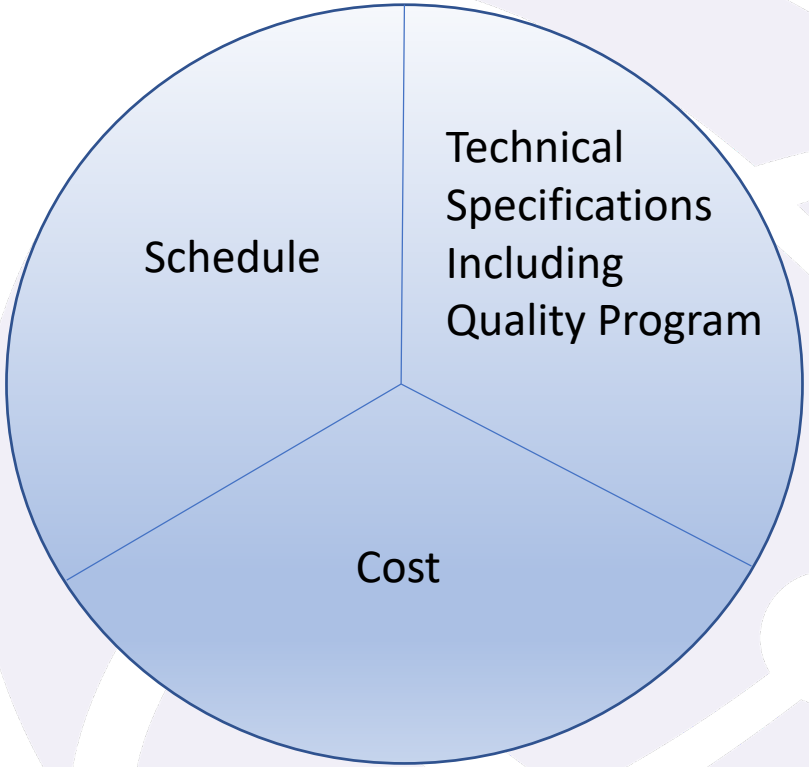
First Article Vessel Construction Contract

Purpose and Scope:

- Expedite the Production Process
- First Article Contracts
  - Provide the means for a subcontractor to develop processes & procedures necessary to construct spherical vessels conforming to the requirements of ENG-TS-J2-1460 and First Article Vessel Design Drawings
  - Allows Subcontractor to implement and exercise all prerequisite processes for vessel production
    - Welding, Machining, NDE, Quality Assurance, and Documentation
  - Allows LANL to validate the effectiveness and ability of a subcontractor to comply with LANL's requirements, including:
    - ENG-TS-J2-1460
    - First Article Drawings

Selection Criteria for Vessel Construction Contract

- First Article
  - Successful completion and acceptable contract performance
- Quality Program
  - Verified during First Article
  - Established/approved prior to Production Award
- Cost and Schedule
  - Preference will be given for Lower Cost and Shorter Construction Duration



Summary of Technical Requirements

Specified Characteristics	Requirements	Verified by
First Article	To establish means & methods to meet requirements for production	See items below as well as LANL Specification ENG-TS-J2-1460
Material Chemical Composition	Weld Metal & HAZ	Chemical Composition & Microstructure Analysis, CMTR's
Mechanical Properties	Weld Metal & HAZ Strength, Hardness, Ductility, Toughness	Tensile, Brinell Hardness, Charpy Impact, Charpy Transition Curves Dynamic Tear Test, & CMTR's
Soundness	Weld Metal & HAZ Lack of weld & process defects	Wet Magnetic Particle & Ultrasonic & Radiographic Testing
Geometry	Fit & form must meet LANL drawing requirements	Dimensional Inspection & Test Reports
Process Control	QA Program, Submittals, Travelers, Procedures, Instructions and Qualification/Certifications	Subcontractor QA Program Qualification, Surveillance, Inspection & Test Reports

Timeline

- Contract Introduction Meetings as Scheduled with Subcontractor
- RFQ issued Aug. 2021
- Intent to Award 4 weeks after Proposal Submittal
- Develop Submittal Approval Schedule by 2 Weeks after Award
- Deliver First Article Components to Subcontractor by mid. Sept.
- Develop Welding Procedure by End of Oct.
- Develop Traveler and Inspection & Test Plan by end of Oct.
- Start Machining Vessel parts by mid Oct.
- Expectation of First Article Vessel complete by Mar. 2022
- Follow First Article Plan to do new Critical Programmatic Vessels
- 1st New Programmatic Vessel done by Dec. 2022

Current Vessel & Component Needs

Current 6' Vessel Component Needs							
Vessels Needed			Total of	20	1st Vessel	By	Mar. - 22
Description	Qty/vessel	Part Size	lbs/ piece	lbs / vessel	Qty PO	Weight PO	Tons PO
HSLA-100 Hemi-Heads	2	2.625" x 72" id.	6,800	13,600	41	278,800	139.4
HSLA-100 Nozzle	5	37.7" od x 23.2" id x 6.9"	1,400	7,000	100	140,000	70
HSLA-100 Cover Disks	5	34.7" od x 6.5"	1,800	9,000	112	201,600	101
Weld Metal lbs	916	Double U Joint Weld Filler	916	916	10,997	10,997	5.5
		Total weight/ Vessel		30,516	Weight/ PO	631,397	315.70

Current 3' Vessel & Component Needs							
Vessels Needed			Total of	9	1st Vessel	By	Dec. -22
Description	Qty/Vessel	Part Size	lbs/ piece	lbs / vessel	Qty PO	Weight PO	Tons PO
HSLA-100 Hemi-Heads	2	1.25" x 36" dia.	900	1,800	19	17,100	8.55
HSLA-100 Top Nozzle	1	25" od x 15.5" id x 6.4"	600	600	11	6,600	3.30
HSLA-100 Top Cover	1	22" od x 6"	540	540	11	5,940	2.97
HSLA-100 Enter Nozzle	2	17.1" od x 5.2" id x 3.8	300	600	18	5,400	2.70
HSLA-100 Exit Nozzle	2	16.5" od x 9.48" id x 3.30"	280	560	18	5,040	2.52
HSLA-100 Base Ring	1	11" od x 5.4" id x 4"	126	126	9	1,134	0.57
Weld Metal lbs	121	Double U Joint Weld Filler	121	121	1,089	1,089	0.54
		Weight/Vessel		2,547	Weight/ PO	25,203	12.60

Questions and Contacts

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